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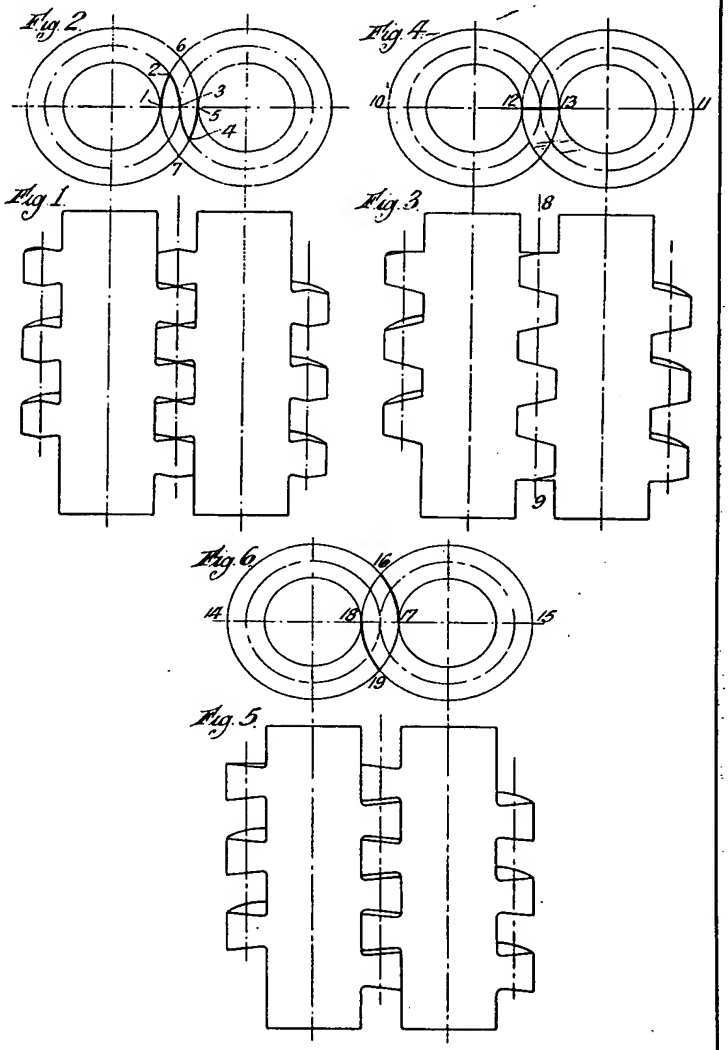
552,562 PROVISIONAL SPECIFICATION

SHEET 1

[This Drawing is a reproduction of the Original on a reduced scale.]



552,562

2 SHEETS
SHEET 2

Fig. 7.

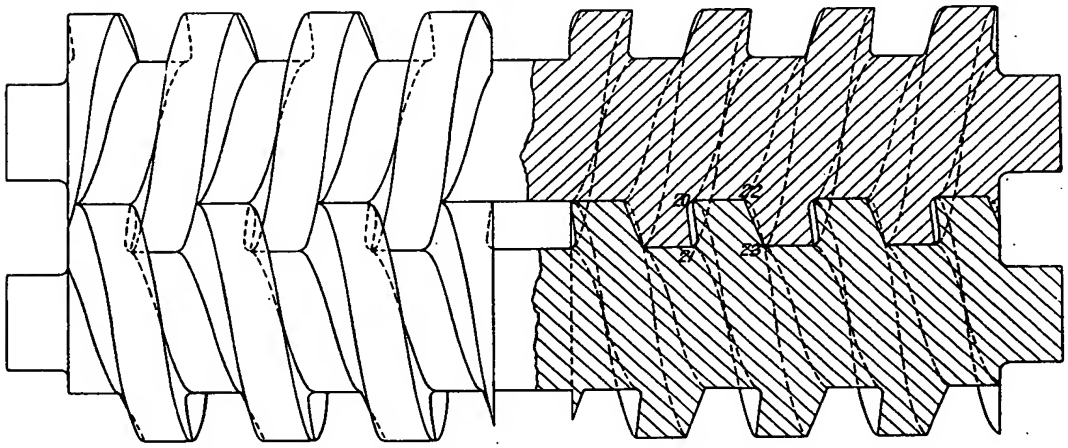
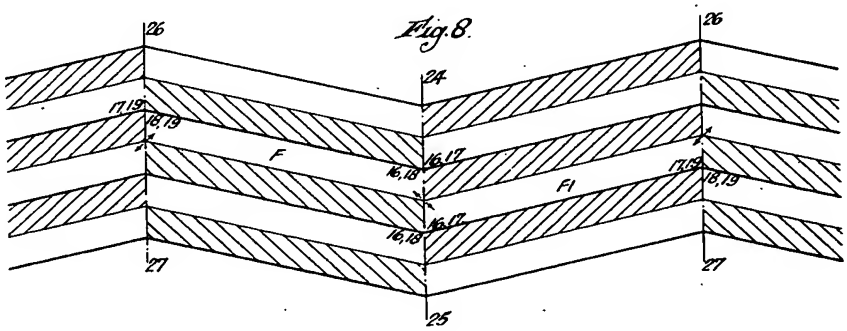


Fig. 8.



Malby & Sons, Photo-Lith.

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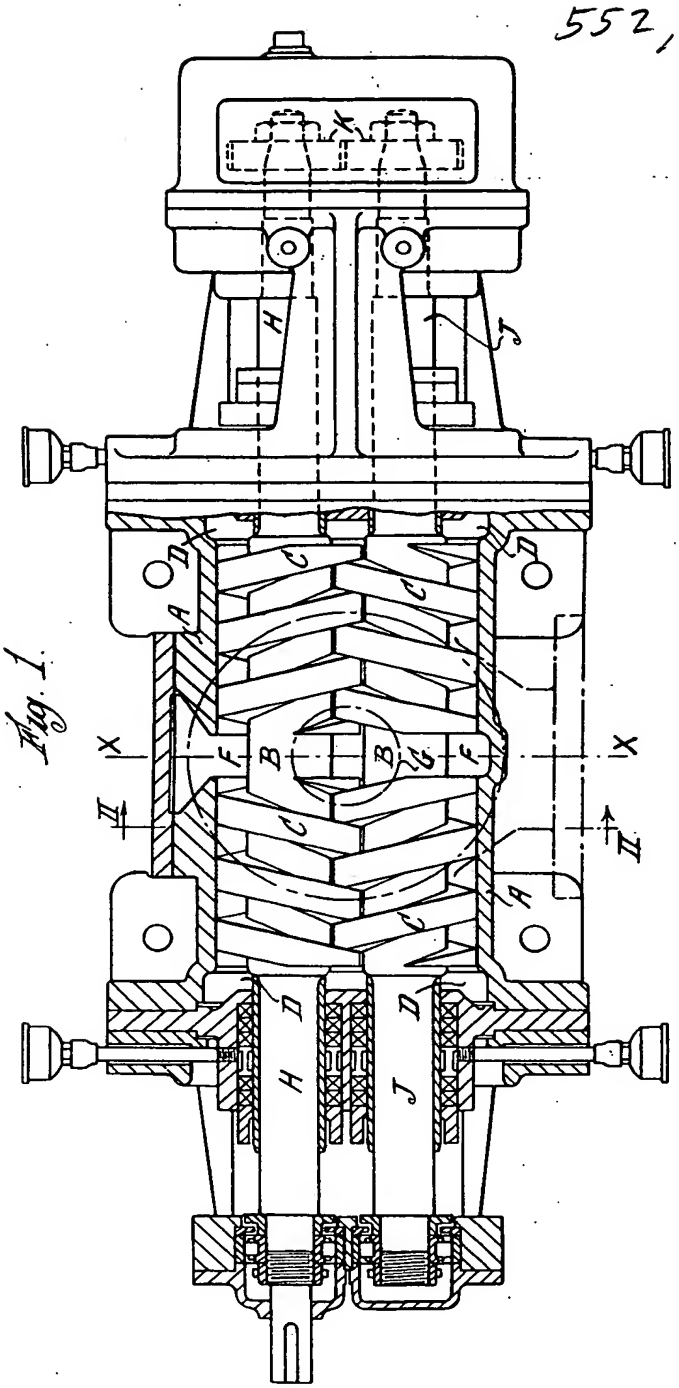
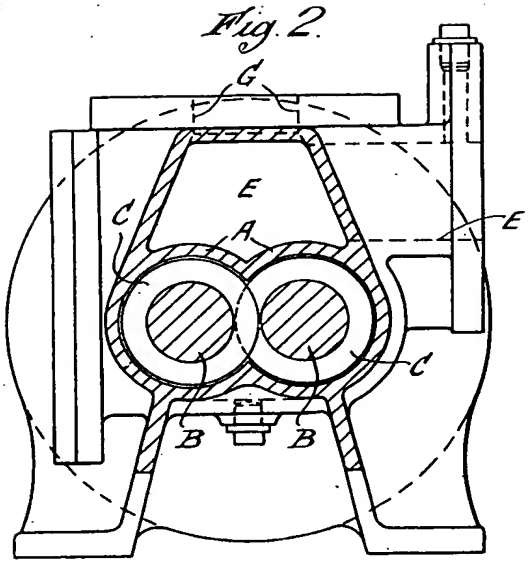


Fig. 1.

552,562 COMPLETE SPECIFICATION

Fig. 2.



552,562.

PATENT SPECIFICATION

Application Date: Sept. 1, 1941. No. 11153/41. 552,562

Complete Specification Left: March 10, 1942.

Complete Specification Accepted: April 14, 1943.

PROVISIONAL SPECIFICATION

Improvements to Screw Displacement Pumps

We, STOTHERT & PITT, LIMITED, a company organised under the laws of Great Britain, of Newark Works, Bath, and GEORGE EWART EDWARD MARSHALL, British subject, of 11, Bloomfield Avenue, Bath, do hereby declare the nature of this invention to be as follows:—

This invention relates to screw displacement pumps where the pumping elements consist of two screws of opposite pitch and rotating in opposite directions having their threads inter-engaging the closure around the outside diameters of the screws, except for the inter-engaging parts, being obtained by a casing which allows free admission of the fluid to the ends of the screws.

Various profiles are at present used for the flanks of the screws, but the known geometrical forms do not give complete closure and the object of this invention is to give complete closure which is effected according to this invention, by using different forms for the opposite flanks of the screws

The invention is illustrated in the accompanying drawings in which figures 1—6 illustrate the most commonly known forms of tooth profiles.

Referring to figures 1 and 2, a thread of this profile would give closure along the heavy lines 1, 2, 3, 4, 5. It will be seen that this type of closure allows fluid to escape from the annular space around one screw to that of the other across the spaces 2, 6, 5 and 1, 7, 4.

In the thread form shown by figures 3 and 4, the profile being symmetrical about the pitch line 8, 9 when viewed in section on line 10, 11, closure is obtained along the line 12, 13. Any angle or form can be used provided it is symmetrical about the pitch line 8, 9 and is self-clearing for the pitch of the screw.

The form shown in figures 5 and 6 has a profile consisting of an undercut thread, which when viewed on section 14, 15 shows spaces between the teeth through which the fluid can pass between the flanks of the screw threads from 16, 18 to 17, 19. A form of this profile gives complete closure along 16, 17, and 18, 19.

[*Price* 1/-]

The present invention consists in providing a form which combines a form giving closure as shown in figures 5 and 6 with a form giving closure between the top and bottom of the screws space, as shown by figures 1 and 2 or 3 and 4. This condition is satisfied as is shown in figure 7 by making the profile of one flank of the screws to suit the condition shown in figures 5 and 6 and the other flank to suit the condition shown in figures 1 and 2 or 3 and 4.

Referring to figure 7 which is a plan view of a double ended screw made in this manner, flank 20, 21 is formed to give the closure shown in figures 5 and 6, and the flank 22, 23 is formed to give the closure shown by figures 3 and 4. Flank 22, 23 could be made in accordance with that shown by figures 1 and 2 or any other form provided it gives complete closure between the shafts so as to prevent fluid passing from the top to the bottom of the screws.

To understand more clearly how this gives complete geometrical closure, reference should be made to figure 8 where a diagrammatic development is given, the teeth being shown shaded and the spaces left clear. 24, 25, is a line of inter-engagement looking on the top of the screw. The two lines 26, 27 on the opposite sides are similar and represent the line of inter-engagement viewed on the bottom of the screws. The flanks which are made to a profile giving complete closure between the top and bottom are indicated by the thin lines. The flanks which give a closure of the type shown in figures 5 and 6 are indicated by the heavy lines. The tooth lines lying outside of the lines 26, 27 belong to the screw on the opposite side. On this development, consider any tooth space F—F, being filled with fluid. Where the flanks give closures of types figures 1 and 2 or 3 and 4 or any other form which would provide closure betwen the top and bottom of the screw space, the fluid can pass from one screw to the other as shown by the small arrows. The opposite flanks are made for giving a closure as shown by figures 5 and 6. Lines 16, 17, figures

ance between the flanks of the teeth of the intermeshing screws, so providing for a high degree of efficiency in operation.

The invention is illustrated in figures 1—8 of the drawings accompanying the provisional specification and in figures 1 and 2 of the accompanying drawing, these figures being respectively a sectional plan and a transverse section on the line II—II in figure 1.

Referring to the accompanying drawing which illustrates by way of example one form of pump with which the invention is concerned, there is employed a pump casing A shaped to provide two intersecting cylindrical working chambers having in them single start screws B of opposite hand and having their screw threads C intermeshing.

As is hereinafter referred to there are two sets of such screws which open at their remote ends to intake or to supply chambers D connecting to a common supply branch E and open at their adjacent ends to a common discharge chamber F connecting to a common discharge branch G.

The screws are arranged to be positively rotated in opposite directions by driving the spindle H of one screw gear and intergearing the spindle and the spindle J of the other screw by gears K. Hence by feeding the liquid to be pumped to the supply chambers D, the liquid is forced by the intermeshing screws axially along them and finally discharged under pressure to the discharge chamber F. It will be evident that in the screw type of pump, the recesses formed between adjacent teeth provide the pump chamber, this chamber being closed by the fit between the periphery of the teeth and the periphery of the cylindrical chamber in the casing A, and by the flanks of the intermeshing screw teeth a series of such chambers being formed along the length of the screws by the various teeth, and communication between one chamber and another being cut off by the co-operating surfaces of the flanks of the teeth so as to prevent as far as possible the liquid to be pumped passing from one chamber to another.

Reference will now be made to the drawings accompanying the provisional specification, in which drawings figures 1—6 illustrate the most commonly known forms of tooth profiles.

Referring to figures 1 and 2, a thread of this profile would give closure between the adjacent chambers formed by the two screws along the heavy lines 1, 2, 3, 4, 5. It will be seen that this type of closure, while preventing the passage of fluid from one side of the zone of inter-engagement of the threads to the other side (such leakage being hereinafter referred to as transverse) does not prevent fluid from passing from the annular space (which forms one working chamber) around one screw to that of the other across the spaces 2, 6, 5, and 1, 7, 4 this latter leakage being referred to as "circumferential" leakage.

Similarly in the thread form shown by figures 3 and 4, the profile being symmetrical about the pitch line 8, 9, when viewed in section on line 10, 11 closure is obtained along the line 12, 13 but here again, while transverse leakages is prevented from the chamber on one screw to the adjacent chamber on the other screw, fluid is not prevented from escaping circumferentially from the chamber of one thread to the chamber of the other thread. Any angle or form can be used provided it is symmetrical about the pitch line 8, 9 and is self-clearing for the pitch of the screw.

The form shown in figures 5 and 6 has a profile consisting of an undercut thread which when viewed on section 14, 15 shows spaces between the teeth through which the fluid can pass transversely between the flanks of the screw threads from 16, 18 to 17, 19 although a form of this profile does give complete circumferential closure along lines 16, 17 and 18, 19.

The present invention employs a flank form which combines to give a closure as shown in figures 5 and 6 (i.e. a circumferential closure) with a closure between the top and bottom of the screw space (i.e. a transverse closure) as shown by figures 1 and 2 or 3 and 4. This condition is satisfied as is shown in figure 7 by making the profile of one flank of the screws to suit the condition shown in figures 5 and 6 and the other flank to suit the condition shown in figures 1 and 2 or 3 and 4.

In addition the present invention employs what is in effect a double screw pump with the screws of one pump so arranged with reference to the screws of the other pump that the thrust on the screws of one pump is opposed to and balances the thrust of opposite sense on the screws of the other pump. This enables the parts to be arranged with running clearances between the intermeshing flanks of the screws; and this, coupled with the particular formation of the flanks to give both "transverse" and "circumferential" closure provides a very efficient pump arrangement capable of delivering liquids under high pressure.

As is shown in the drawings to which

clearance formed between the threads of the screws.

2. A screw pump as claimed in claim 1 and wherein the respective screws of the two pumps are formed by two screws of opposite hand on one and the same member.

3. A screw pump as claimed in claim 1 or 2 and wherein each of the screws has screw teeth provided with flanks on one side to the form indicated by figures 1 and 2 or 3 and 4 of the drawings accompanying the provisional specification and on the other side to the form indicated by figures 5 and 6.

4. A screw pump wherein each of the screws has screw teeth substantially as described with reference to figure 7 of the drawings accompanying the provisional specification.

5. A screw pump substantially as described with reference to the accompanying drawings.

Dated this 10th day of March, 1942.

CARPMAELS & RANSFORD,
Agents for Applicants,
24, Southampton Buildings,
London, W.C.2.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1943.